

# THE WEATHER AND CIRCULATION OF MAY 1969

## A Mild Month With an Increase of Blocking at High Latitudes

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### 1. MEAN CIRCULATION

Principal features of the mean 700-mb circulation for May were two blocking ridges with heights 70 to 80 m above normal in the Arctic and five vigorous surrounding troughs with heights 70 to 110 m below normal (figs. 1 and 2). The troughs, listed in descending order according to depth of height anomaly, were located over western Siberia, the eastern Atlantic, Hudson Strait, the Asiatic

coast, and the eastern Pacific. This circulation was considerably more amplified than that of April at middle to high latitudes (Andrews, 1969), and blocking was more pronounced. The amplification and associated height changes from April to May (fig. 3) were related to development and retrogression of a number of systems. Ridges that were in northwestern Canada and east of Greenland during April strengthened and retrograded, accompanied

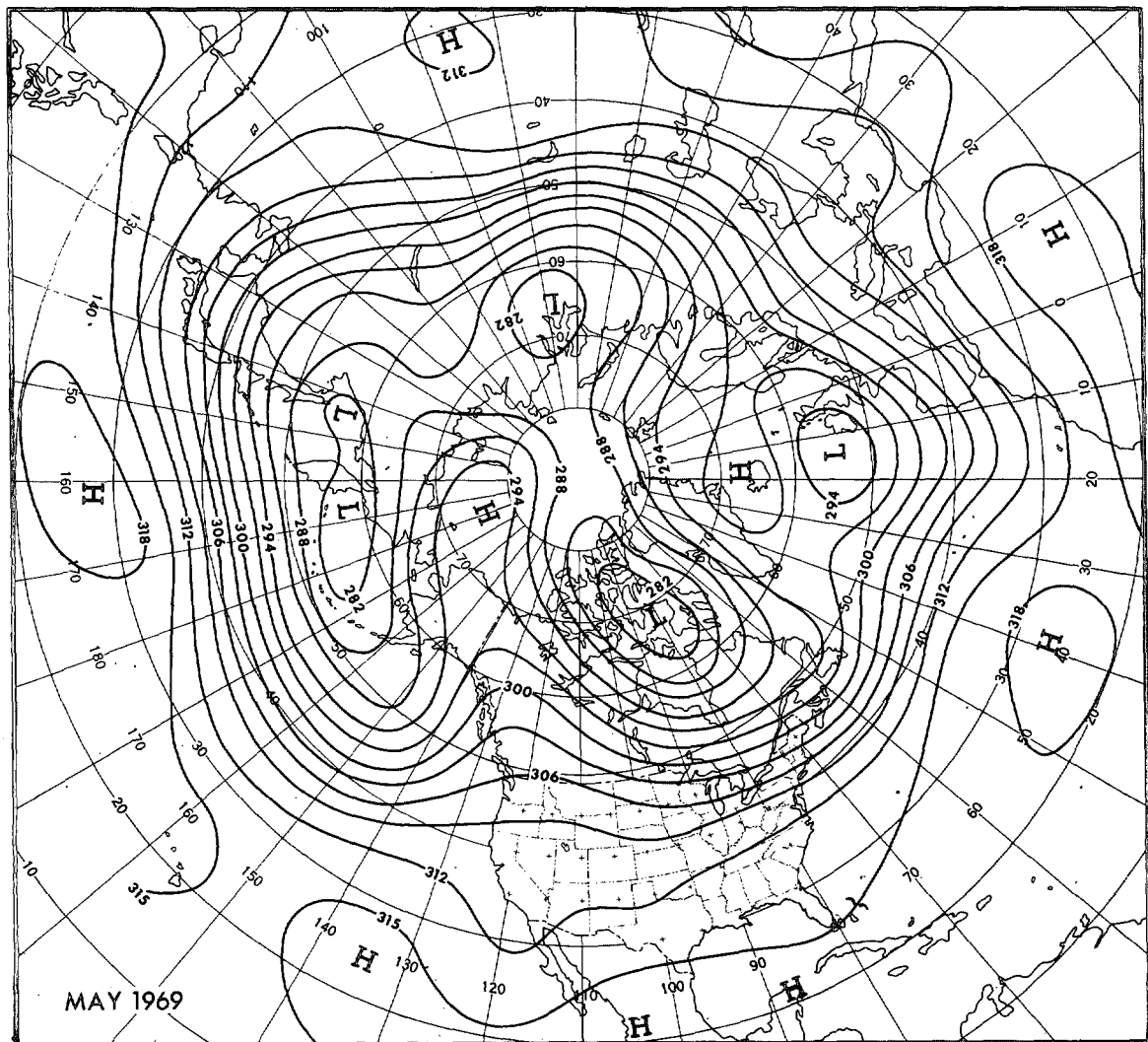


FIGURE 1.—Mean 700-mb contours (decameters) for May 1969.

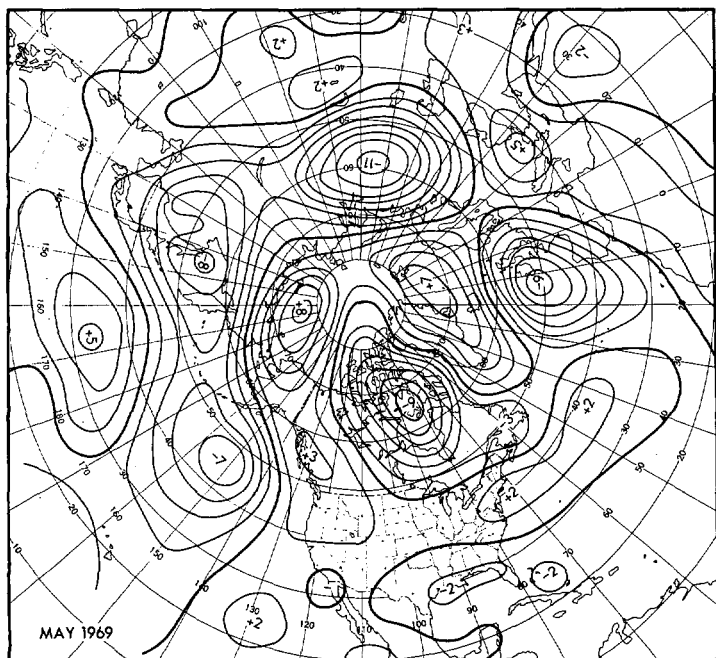


FIGURE 2.—Departure from normal of mean 700-mb height (decameters) for May 1969.

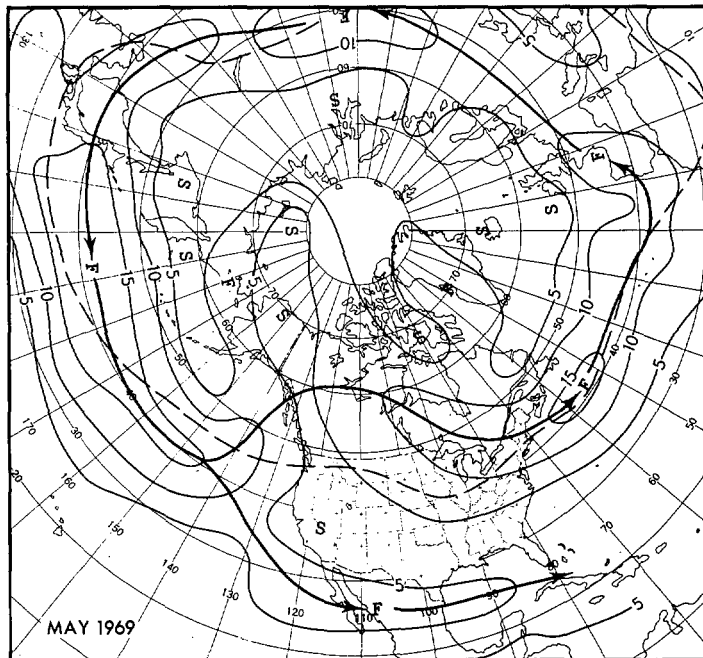


FIGURE 4.—Mean 700-mb isotachs (meters per second) for May 1969. Solid arrows show principal axes of maximum wind speed and dashes the May normal.

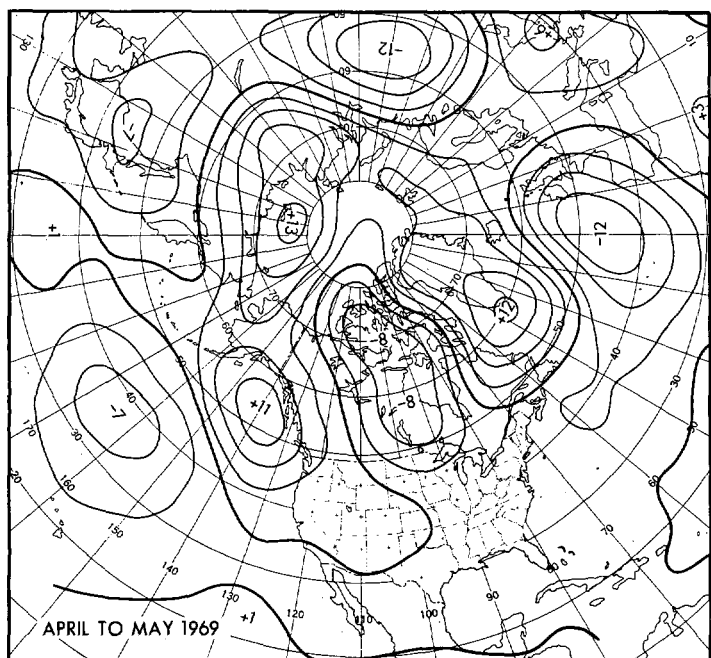


FIGURE 3.—Mean 700-mb height anomaly change (decameters) from April to May 1969.

by strong height rises across Greenland and from the Gulf of Alaska to the East Siberian Sea. Trough development in Eurasia and the eastern Atlantic accounted for falls of more than 100 m, and smaller falls attended the retrogression of troughs from Davis Strait and the Gulf of Alaska.

Average wind speeds decreased in the polar ( $55^{\circ}$ – $70^{\circ}$  N.) and temperate ( $35^{\circ}$ – $55^{\circ}$  N.) westerly zones from April to May over the western sector of the Northern Hemisphere, but remained above normal in the temperate zone. Winds were very fast across the northwestern Pacific where sea-level storms were frequent and deep. These storms followed a principal track along the mean jet (fig. 4) that was north of normal around the strong subtropical ridge in the western Pacific, but was south of normal in the eastern Pacific where the influence of blocking was greater. Most migratory cyclones followed the jet maximum across North America well north of expected paths, but departed little from usual in the Atlantic.

## 2. TEMPERATURE AND PRECIPITATION

Much above-normal temperatures prevailed in the West beneath the strong ridge, but departures elsewhere were generally less than  $2^{\circ}\text{F}$  under small-amplitude westerly flow (figs. 5 and 1). Negative temperature anomalies were chiefly confined to the South, where height anomalies were also negative and rainfall was unusually plentiful, and the Northeast (figs. 2 and 6). The greatest temperature anomalies,  $6^{\circ}\text{F}$  in eastern Nevada, were the product of persistently warm, but not extreme, daily temperatures shown by the curve of anomalies for Ely in figure 7. Only 1 day was cooler than normal at Ely, and none were more than  $12^{\circ}\text{F}$  above normal. Much larger daily variations east of the Divide are indicated by the curve for Marquette, Mich., in the same figure. Cool outbreaks there from the Pacific and Canada alternated with warm

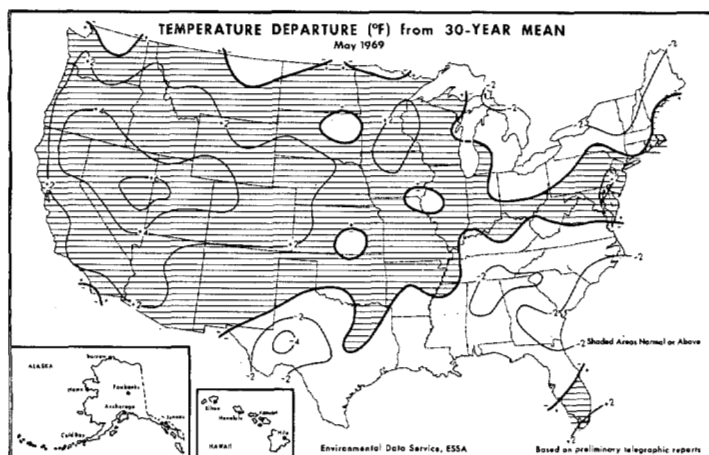


FIGURE 5.—Departure from normal of average surface temperature (°F) for May 1969 (from Environmental Data Service, 1969).

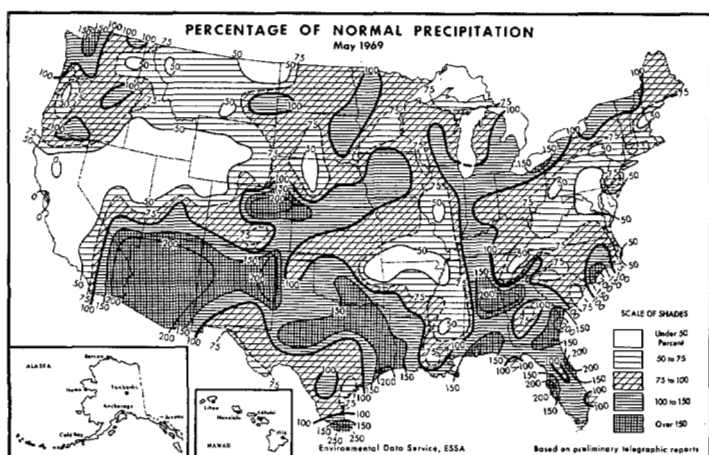


FIGURE 6.—Percentage of normal precipitation for May 1969 (from Environmental Data Service, 1969).

spells, the last of which reached the magnitude of a heat wave. During the hot weather, many record daily maxima and several all-time highs were established. Details are in the next section.

More than usual precipitation for May fell in the Southern States under the influence of slight cyclonic circulation and negative height anomalies (figs. 6 and 1). While most of Arizona and parts of adjacent States received more than twice the normal rainfall, nearly all the amounts in this seasonally arid region were less than 1 in. East of the Divide, a large part of the South received more than 4 in. Partly because of its showery nature, rainfall in the South was distributed unevenly; Jackson, Miss., reported about one-third of normal, while Birmingham, Ala., had more than three times normal, the most for any May. Other wet regions included a streak from the Central Rockies through the eastern Great Lakes, produced by troughs emerging from the Southwest and heavy amounts in sections of the Pacific Northwest. Elsewhere, under relatively dry westerly

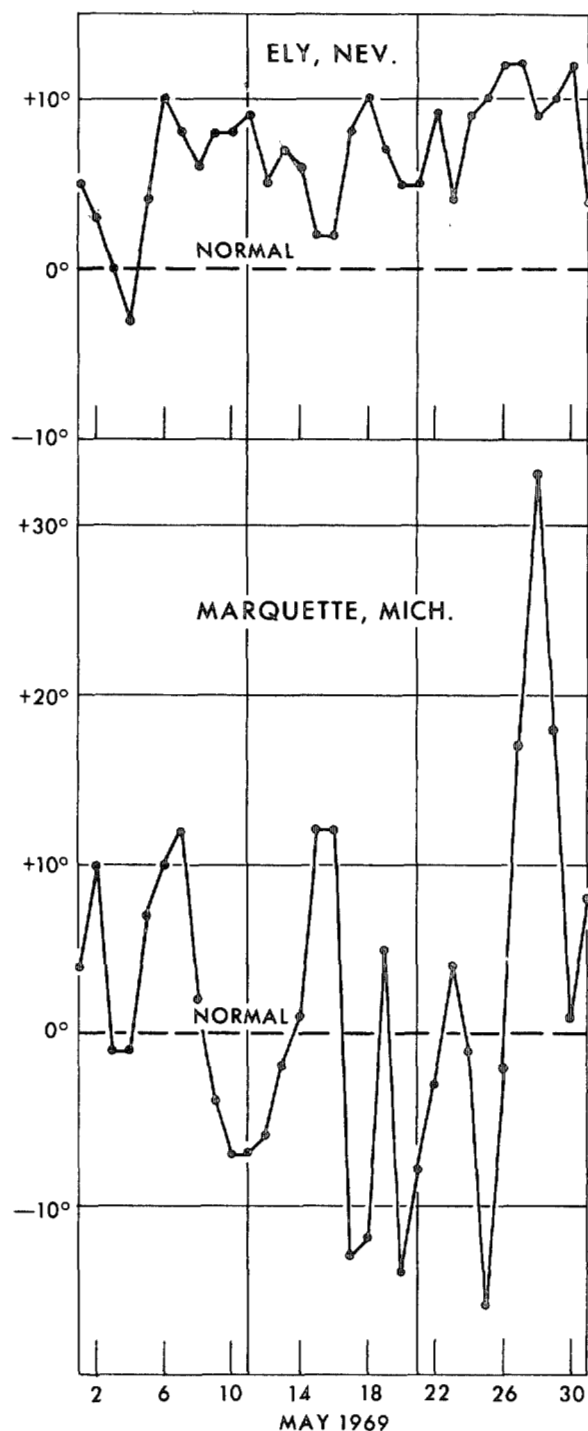


FIGURE 7.—Departure from normal of daily average temperatures for May at Ely, Nev., and Marquette, Mich.

flow aloft and few migrating cyclones, precipitation was generally less than normal. More than half the area from California to the Northern Plains received less than an inch.

#### INTRAMONTHLY VARIATIONS

Early in May, a ridge developed over the Western States and persisted nearly all month. The trough down-

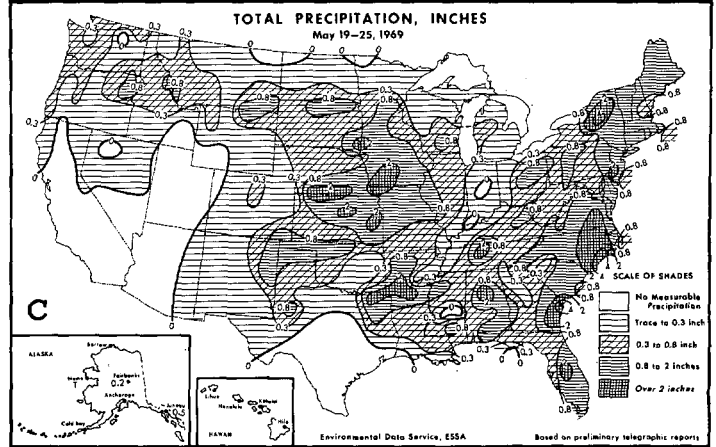
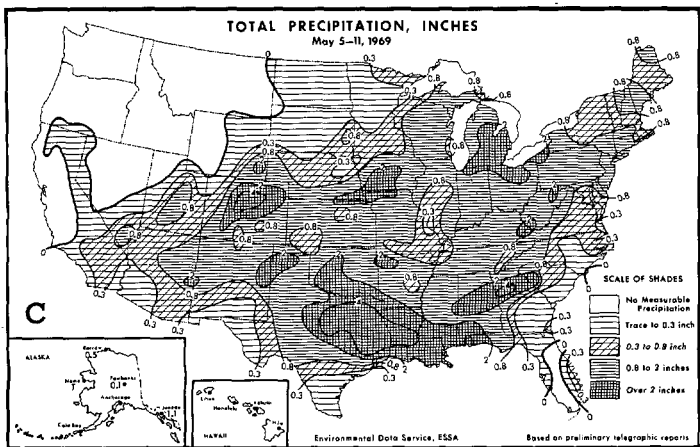
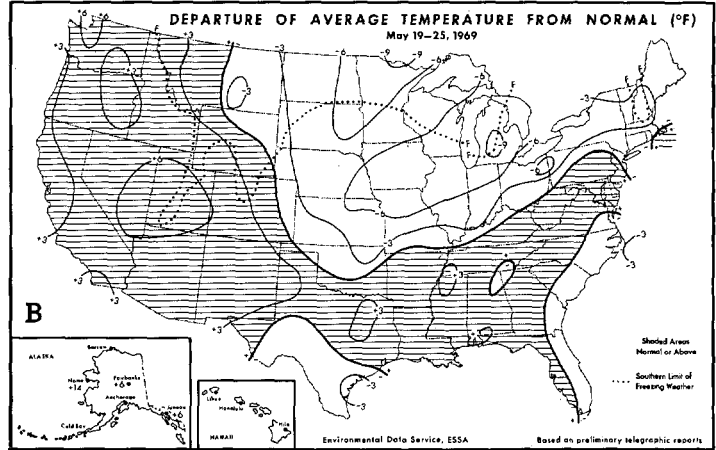
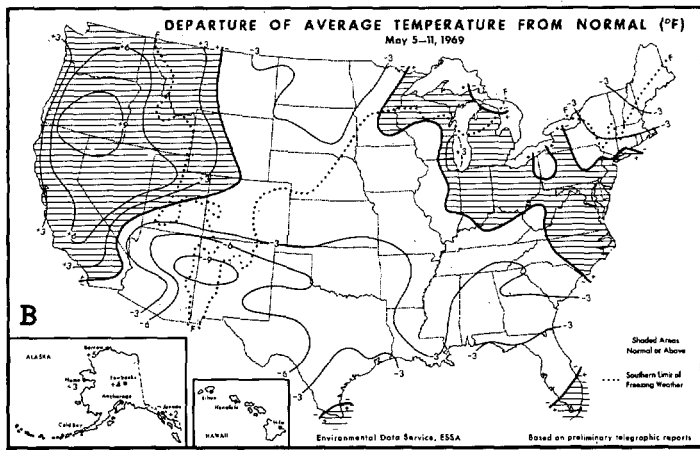
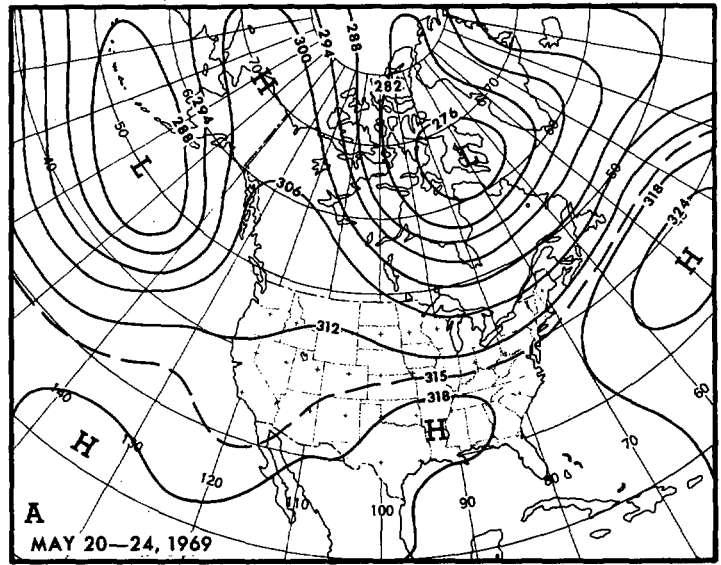
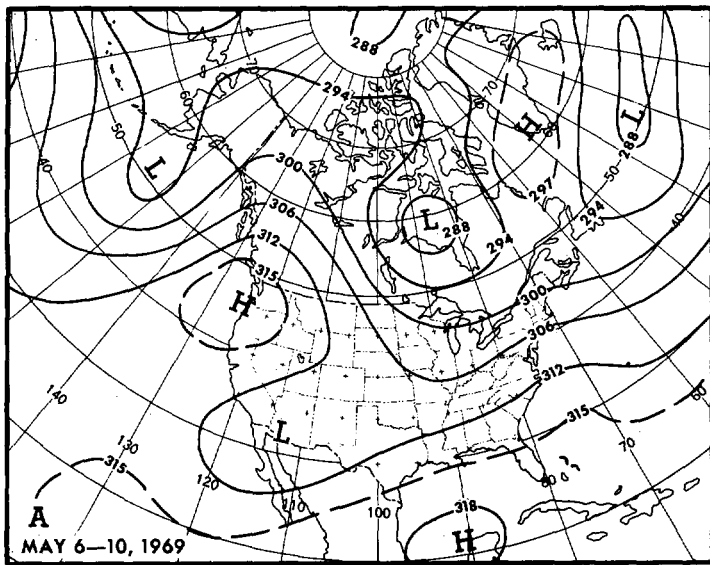


FIGURE 8.—(A) mean 700-mb contours (decameters) for May 6-10, 1969; (B) departure from normal of average surface temperature (°F) and (C) total precipitation (inches), both for May 5-11, 1969. (B and C from Environmental Data Service, 1969.)

FIGURE 9.—Same as figure 8 except (A) for May 20-24, 1969; (B) and (C) for May 19-25, 1969 (both from Environmental Data Service, 1969).

stream was deepest during the week of May 5-11, when much of the heaviest rainfall and severe weather occurred (figs. 8A, C). Several notable weather events on May 7, mostly associated with a deep Southwest Low, included

rain in 39 States, severe flooding near Denver, a minimum temperature of 32°F at Douglas, Ariz., and tornadoes in Texas, Ohio, Kentucky, and Mississippi. Temperatures for the week averaged well above normal from the Pacific

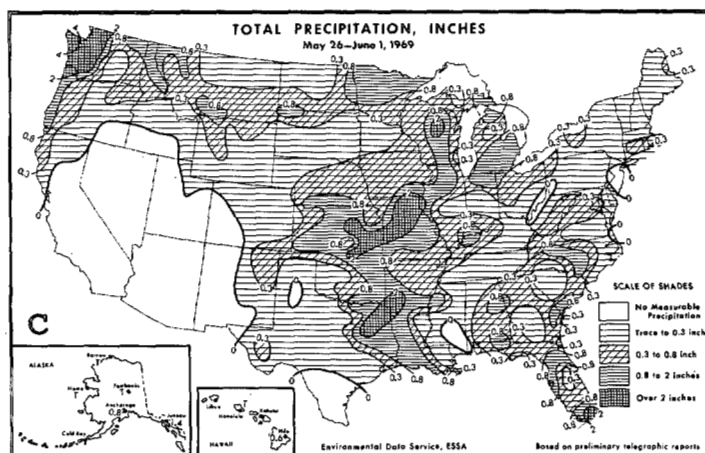
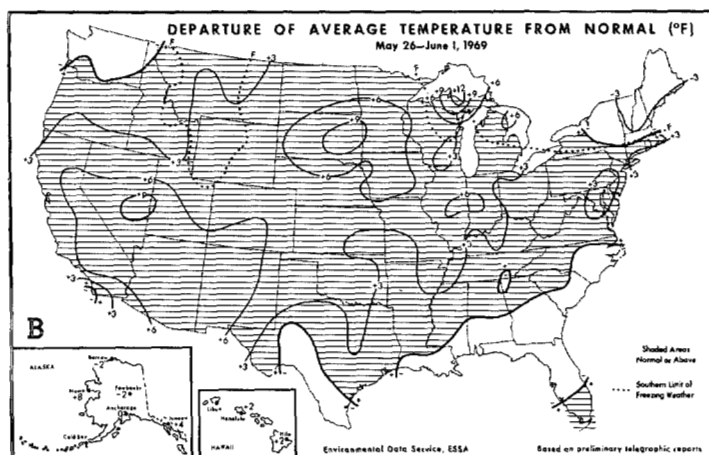
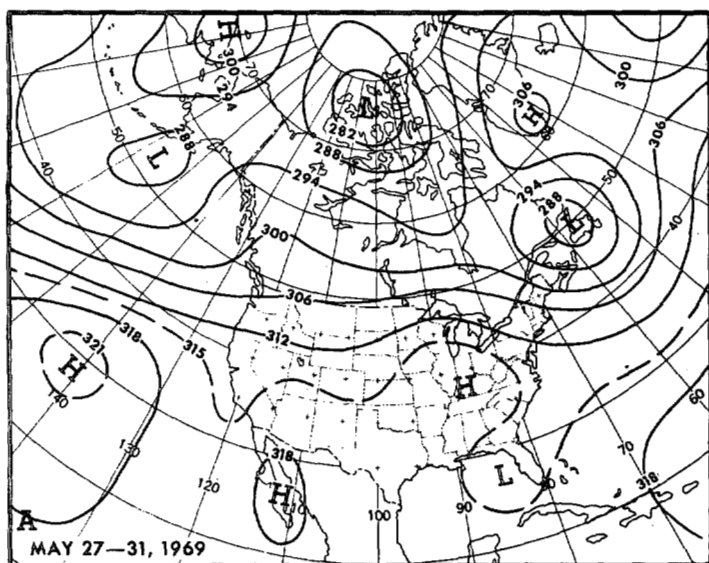


FIGURE 10.—Same as figure 8 except (A) for May 27-31, 1969; (B) and (C) for May 26-June 1, 1969 (both from Environmental Data Service, 1969).

coast to the northern and central Rockies and 6° to 10°F below in the southern Rockies (fig. 8B).

Temporary loss of amplitude of the circulation across the Northern States the following week (not shown)

brought warmer temperatures to the Northern and Central Plains. Cool weather persisted in the South, and cyclonic activity continued from the Southwest at much reduced intensity. Thunderstorms were again reported in the Southern Plains and parts of the South. Scattered tornadoes occurred from Texas to Wisconsin and in the Southeast.

Reamplification the week of May 19-25 in Canada and the Northern States brought cooler weather to the North Central States while ridging led to warmer temperatures in the South (figs. 9A, B). Temperature gradients and frontal activity increased across the zone of confluence that developed in the East. Frontal showers occurred almost everywhere east of the Divide (fig. 9C). By midweek, severe thunderstorms and tornadoes had struck from the Texas Panhandle to northwestern Missouri, and the week ended with more severe weather in the South.

The final week brought rapid changes in the circulation. The Alaskan ridge split, the Hudson Bay Low retrograded and weakened, a developing Low approached Newfoundland, and heights continued to rise over the Great Lakes. Flow across the United States thereby became west-southwesterly from the Pacific to the Appalachians, resulting in warming over most of the Country (fig. 10). The heat wave that spread eastward from the Central Rockies quickly raised temperatures that early in the week were low enough to set new daily minima from the Great Lakes to New England. At Green Bay, Wis., a daily record low of 31°F on the 26th was followed by a record high of 87°F on the 28th. Pierre, S. Dak., was one of the warmest reporting stations in the Nation on the 28th, with a maximum of 105°F. At Marquette, Mich., the daily average was 16°F below normal on the 25th and 33°F above normal on the 28th (fig. 7). Near the origin of the heat wave, Cheyenne, Wyo., had 90°F on the 27th, the highest of record so early in the season. New highs for the month included 91°F at Casper, Wyo., and 100°F at Rapid City, S. Dak., both on the 27th, followed by 100°F at Marquette, Mich., on the 28th. Trenton, N.J., reported the highest daily average, 82°F on the 29th.

#### REFERENCES

- Andrews, J. F., "The Weather and Circulation of April 1969—A Warm Month Accompanied by Severe Flooding in the Upper Midwest and Increased Westerlies," *Monthly Weather Review*, Vol. 97, No. 7, July 1969, pp. 523-526.
- Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin*, Vol. 56, Nos. 19, 21, 22, and 23, May 12, 26, June 2 and 9, 1969.